PHYSICAL AND MECHANICAL PROPERTIES OF CONCRETE USING FLY ASH AND RECYCLED CONCRETE AGGREGATES

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To my beloved parents

&

Assoc. Prof. Dr. A.S.M. Abdul Awal

Thanks for your guidance and support to me

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ABSTRACT

In this research, physical and mechanical properties of concrete were investigated by using fly ash and recycled concrete aggregates (RCA) as partial replacement. Fly ash was collected from the Tanjung Bin Power Plant at Pontian and recycled concrete aggregates were obtained from waste at laboratory. So, 20% of total amount of cement was replaced by fly ash as partial replacement but for recycled concrete aggregates, it was replaced coarse aggregates as 0%, 25%, 50%, 75% and 100% to check which is the best combination. The dosage of superplasticizer in this study was 1.5% of weight of cement and 0.4 water/cement ratio was used in the mixture.. A number of tests were conducted to investigate fresh and hardened state properties like slump, ultrasonic pulse velocity, compressive, tensile and flexural strength of fly ash and recycled aggregates concrete. Test specimens comprising of cube, cylinder and prism were prepared and tested after 1, 7, 28 and 56 days of water curing. It was found that the workability of the concrete was reduced as the percentage of RCA increased. The range of the workability of the fresh concrete was fall at 65 mm to 130 mm. However, high content of RCA was increased the water absorption of the concrete. The result has obtained that the water absorption of concrete was in the range of 5.38% to 8.65% among the samples. A reduction on compressive, tensile and flexural strength occurred as the content of replacement increased. As conclusion, concrete with 20% of fly ash and 25% of recycled aggregates as partial replacement was concluded as the best mixed ratio since the mechanical properties of the concrete was almost equal to the conventional concrete. The maximum compressive strength of the sample was 34.55 MPa while splitting tensile strength and flexural strength have achieved 3.7 MPa and 4.35 MPa.

ABSTRAK

Dalam kajian ini, sifat-sifat fizikal dan mekanikal konkrit telah disiasat dengan menggunakan abu terbang konkrit dan agregat dikitar semula (RCA) sebagai pengganti separa. Abu terbang dikumpulkan dari Loji Tanjung Bin di Pontian dan agregat konkrit kitar semula yang diperolehi daripada sisa buangan di makmal. Oleh itu, 20% daripada jumlah simen digantikan dengan abu terbang sebagai sebahagian penggantian tetapi untuk agregat konkrit kitar semula, ia telah digantikan agregat kasar sebagai 0%, 25%, 50%, 75% dan 100% untuk memeriksa kombinasi yang terbaik. Dos superplasticizer dalam kajian ini adalah 1.5% daripada berat simen dan nisbah air/simen digunakan adalah 0.40. Beberapa ujian telah dijalankan untuk mengkaji sifat-sifat konkrit dalam keadaan segar dan keras seperti kemerosotan, halaju denyutan ultrasonik, mampatan, tegangan dan kekuatan lenturan abu terbang dan dikitar semula agregat konkrit. Spesimen ujian yang terdiri daripada kiub, silinder dan prisma telah disediakan dan diuji selepas 1, 7, 28 dan 56 hari pengawetan air. Ia telah mendapati bahawa kebolehkerjaan konkrit telah dikurangkan apabila peratusan RCA meningkat. Julat kebolehkerjaan konkrit segar adalah 65 mm hingga 130 mm. Walau bagaimanapun, kandungan tinggi RCA telah meningkat penyerapan air konkrit. Hasilnya telah mendapat bahawa penyerapan air konkrit adalah dalam lingkungan 5.38% hingga 8.65% di kalangan sampel. Pengurangan pada mampatan, tegangan dan kekuatan lenturan berlaku apabila kandungan RCA sebagai penggantian meningkat. Kesimpulannya, konkrit dengan 20% abu terbang dan 25% agregat kitar semula disimpulkan sebagai nisbah campuran yang terbaik kerana sifat-sifat mekanikal konkrit yang hampir sama dengan konkrit konvensional.